CORAL REEFS & GLOBAL CLIMATE CHANGE:

Rising tides, temperatures and costs to reef communities

Over the last twenty years, human-induced climate change and global warming have become areas of increasing concern for scientists, environmentalists, and public policy makers. While research into the causes and impact of climate change continues, it is becoming increasingly clear that coral reefs are among those environments most threatened by this phenomenon. An increase in sea surface temperatures, rising sea levels, and more frequent and/or severe storms are some of the effects of climate change that can negatively impact coral reefs. These negative impacts lead to declines in reef fisheries, less coastal protection, and losses in organic materials that build beaches and coastlines. The economic losses from these services can total billions of dollars.

LIKELY IMPACTS OF CLIMATE CHANGE TO CORAL REEFS

- **Coral Bleaching.** Corals are extremely sensitive to temperature changes. Increased water temperatures, which may be linked to global warming, can cause mass coral bleaching. Bleaching occurs when coral polyps, stressed by heat or ultraviolet radiation, expel the symbiotic algae that live within coral tissues. When the algae are expelled, the coral appears white or "bleached." These algae provide corals with most of their food and oxygen. Corals can recover after short periods of bleaching, but as the length and severity of the stress increase so does coral mortality. Coral bleaching events and subsequent reef mortality are expected to become more frequent as sea temperature increases.
- **Slower Coral Growth.** Sea level is expected to increase 6–37.5 inches (15–95 cm) over the next century. The vertical growth rate of coral is likely to be slower than this increase. As a result, corals will be deeper, receive less sunlight and grow more slowly. The combined effect of deeper reefs and slower growth will cause two problems for coastal areas: 1) corals will not be able to protect the shore as effectively and wave energy could increase in strength; and 2) smaller reefs will produce smaller amounts of reef sediment which builds and supports island land-bases.
- **Physical Damage to Coral Reefs.** Increased coral mortality is expected as storm events and cyclones become more frequent and intense. Coral reef growth may not be able to keep pace with these destructive events.
- **Coral Mortality.** Rising sea temperatures and sea levels and increasing frequency of storms will increase coral mortality and seriously endanger coral reefs, especially those already under stress. These climatic changes could become the proverbial straw that breaks the camel's back for reefs facing stresses such as poor water quality, destructive fishing and tourism impacts.

LIKELY COST TO HUMANS: A CASE STUDY, VITI LEVU, FIJI

Viti Levu is the largest island in Fiji supporting 77 percent of Fiji's population. The major cities, industries and tourism facilities are all on this main island. By 2050 The World Bank predicts that climate change could produce economic losses of US$23-52 million a year.[1]

(continued)

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LIKELY COST TO HUMANS: A CASE STUDY, VITI LEVU, FIJI (continued)

- Approximately 86 percent of Viti Levu's coastal zone lies at levels less than 5 meters above sea level. Intensive coastal development, deforestation, pollution, and increased exploitation of coastal resources have already threatened the coastal area with increased erosion, flooding and excess run-off. Expected increases in sea level will submerge a high percentage of the coastline and will have intense ramifications for coastal areas during storm events.

- The rise in sea surface temperature is predicted to increase the incidence of ciguatera poisoning. This form of food poisoning is caused by the consumption of fish that have eaten ciguatoxic algae that commonly grows after storm events. The presence of this disease is expected to rise from 35,000–70,000 people to 160,000–430,000 by 2050.

- The total economic losses of coral reef degradation attributed to climate change is estimated to be between US $5 to14 million a year by 2050, primarily through the loss of fisheries, habitat and tourism value.

WHAT CAN WE DO TO PROTECT CORAL REEFS FROM CLIMATE CHANGE?

1. **Create Effective Marine Protected Areas (MPAs).** Create MPAs in areas that are less prone to bleaching events because of local cold-water currents or upwellings.

2. **Lessen Other Pressures on Coral Reefs.** Reefs with fewer stresses will be more likely to recover from coral bleaching and adapt to increased temperatures. Countries and communities need to enforce laws against coral destruction, as well as control pollutants, and promote sources of construction material other than coral. Controlling coastal development through an Integrated Coastal Zone Management (ICZM) strategy can help protect reefs from long-term stresses.

3. **Identify How To Adapt.** Governments, especially those of island nations, need to assess how to adapt to these changes in coral reefs and develop a national strategy to deal with these impacts in consultation with local communities and the private sector.

4. **Adopt Policies and Treaties To Reduce Greenhouse Gas Emissions and Climate Change.** The reduction of greenhouse gases will decrease the severity of global climate change. All countries are encouraged to support, ratify and implement the Kyoto Climate Change Convention. All countries are also encouraged to participate in the work of the UN Framework Convention on Climate Change (UNFCCC) and the Intergovernmental Panel on Climate Change (IPCC).

5. **Protect and Enhance Ecosystems That Absorb Greenhouse Gases.** The loss of some ecosystems, especially forests and wetlands, contributes a significant amount of carbon dioxide and other greenhouse gases to the atmosphere. Governments can mitigate the severity of climate change by protecting and enhancing these ecosystems, a strategy known as natural carbon sequestration. Natural carbon sequestration is the process of removing carbon dioxide from the atmosphere by enhancing ecosystems, such as forests, that absorb greenhouse gases. Carbon sequestration should be considered as a primary management strategy.

For more information contact:

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[1] Case study data is from:
Papua New Guinea and Pacific Island Country Unit The World Bank. 2000. *Cities, Sea and Storms: Managing Change in Pacific Island Economies Volume IV Adapting to Climate Change Summary Version.* World Bank, Washington D.C.